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PRELIMINARY TESTS OF SYNTHETIC ORGANIC COMPOUNDS AS INSECTICIDES. PART V.

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This is the fifth of a series of papers reporting preliminary tests with synthetic organic compounds, which were started at the insecticide-testing laboratory of this Bureau at Sanford, Fla., and continued at Anaheim, Calif. In the previous papers (E-621, E-634, E-729, and E-738) tests with more than 1,100 compounds are reported. This paper gives the results obtained from 76 additional compounds received and tested during 1945 and 1946. The Division of Insecticide Investigations [1] supplied all samples, which they either prepared or purchased from commercial sources.

All compounds were tested against at least three species of insects; some of the more toxic materials were tested against as many as seven. The following species were used in the tests:

Alder flea beetle (*Altica ambiens* (Lec.))
Armyworm (*Cirphis unipuncta* (Haw.))
California oakworm (*Phryganidia californica* Pack.)
Celery leaf tier (*Phlyctaenia rubigalis* (Guen.))
Granary weevil (*Sitophilus granarius* (L.))
Large milkweed bug (*Oncopeltus fasciatus* (Dall.))
Melonworm (*Diaphania hyalinata* (L.))
Southern armyworm (*Prodenia eridania* (Cram.))
Spider mites (*Tetranychus* spp.)
Variegated cutworm (*Peridroma margaritosa* (Haw.))
Vegetable weevil (*Listroderes obliquus* Klug)
Yellow-striped armyworm (*Prodenia ornithogalli* Guen.)

All insects were reared in the laboratory, except the vegetable weevil, the alder flea beetle (larvae), and the spider mites (all stages). The last two were collected in the field. Equipment and certain methods employed have been described by Swingle, Phillips, and Gahan. [2]

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[1] The writers acknowledge the assistance of R. C. Roark, H. L. Haller, and other members of the Division of Insecticide Investigations, who supplied the compounds and furnished the formulas given in this paper.

[2] Swingle, M. C., Phillips, A. M., and Gahan, J. B. Laboratory testing of natural and synthetic organic substances as insecticides. Jour. Econ. Ent. 34: 95-99. 1941.

The experimental procedures were the same as those followed in Part III, with the exception of the fumigation test. In this test 0.25 gram of sample was used against 10 or more adult granary weevils confined in the lower half of a petri dish with a few grains of barley for food.

When received for testing, the samples had been diluted to 25 percent in pyrophyllite and generally were in good physical condition for dusting. Preliminary dust tests against leaf-feeding insects were made on all samples by feeding to larvae leaf sections that had been dusted with the 25-percent material. The dust was applied in a settling chamber, described by Swingle, Phillips, and Gahan, 2/ to both surfaces of the leaves, and the amount deposited was determined by weighing an aluminum plate dusted at the same time. The treated leaf sections were then placed in 9-cm. petri dishes together with eight fourth-instar larvae. A total of 24 larvae was used for each test. Examinations were made after 3 days, and the mortality and estimated feeding recorded.

Materials causing mortalities of 75 percent or higher to one or more species were tested further to indicate their relative effectiveness when applied as sprays or dusts; to determine their toxicity to green foliage, their volatility, and their effectiveness as fumigants; and to distinguish between contact and stomach poisons.

For comparative purposes tests were made with benzene hexachloride, the gamma isomer of benzene hexachloride, DDT, and o-dichlorobenzene--insecticides of known effectiveness against certain of these insects. Results of these tests are shown in table 1.

Data on 18 organic compounds that caused greater than 75 percent mortality to one or more species of insects in dust tests are shown in table 2. Four of these compounds--chloromethyl 4-chlorophenyl sulfone, chloromethyl phenyl sulfone, methyl-4-chlorophenyl sulfone, and 1,1,1-trichloro-2,2-bis(3,5-dichloro-2-hydroxyphenyl)ethane--caused 90 to 100 percent mortality of three or more species. In further tests it was found that the first two acted as both stomach and contact poisons, and the last two only as stomach poisons. Three of these materials are sulfones and therefore closely related chemically. Slight to moderate feeding occurred in all tests. Chloromethyl 4-chlorophenyl sulfone and chloromethyl phenyl sulfone volatilized to the extent of 52 and 48 percent, respectively. Both compounds were ineffective when tested as fumigants against the granary weevil.

Of all the materials listed in table 2, only one--2-(diethylamino)-ethyl pentachlorophenyl ether, caused more than slight injury to any green foliage tested. When sprayed onto young plants this compound caused severe injury to corn and tomato, and moderate injury to lima bean, pumpkin, and sweetpotato.

The compounds that caused less than 75 percent mortality of the species against which they were tested are listed in table 3.

SUMMARY

The results of tests of 76 compounds are included in this paper, which is the fifth of a series reporting preliminary laboratory tests to determine the insecticidal value of synthetic organic compounds (E-621, E-634, E-729, and E-738). Eighteen compounds gave greater than 75 percent mortality against one or more species of insects, and four--chloromethyl 4-chlorophenyl sulfone, chloromethyl phenyl sulfone, methyl-4-chlorophenyl sulfone, and 1,1,1-trichloro-2,2-bis(3,5-dichloro-2-hydroxyphenyl)ethane -- were very toxic against three or more species. Only one of the 18 toxic materials caused more than slight foliage injury.

Volatile materials were ineffective when tested as fumigants against the granary weevil.

Table 1. -- Effectiveness of four insecticides tested against various species of insects fed dusted foliage, to be used as standards for comparing results obtained with new insecticidal compounds

Compound	Insect 1/	Foliage	Feeding 2/	Average deposit per square centimeter	Average mortality in 3 days
				Micrograms	Percent
Benzene hexachloride (technical)3/ 10%	Spider mite	Castor bean	-	250	88
Benzene hexachloride, gamma isomer 5%	Vegetable weevil	Mustard	2	285	92
DDT: 0.5%	Armyworm	Barley, corn	2	120	60
	Celery leaf tier	Celery	1	130	81
	California oakworm	Oak	1	110	100
	Melonworm	Pumpkin	2	75	100
	Variegated cutworm	Barley, corn	2	105	93
1%	Large milkweed bug	Milkweed seed	-	230	49
	Southern armyworm	Collard	3	95	67
	Yellow-striped armyworm	Cabbage	2	180	67
3%	Alder flea beetle	Alder	0	200	67
o-Dichlorobenzene 100%	Granary weevil	Barley, grain	-	.02cc	87

1/ Fourth instars, except the spider mite, in all stages, and the granary weevil, in the adult stage.

2/ 0, none; 1, slight; 2, moderate; 3, much.

3/ Commercial product reported to contain 30 to 40 percent of the gamma isomer.

Table 2. -- Compounds causing greater than 75 percent mortality of one or more species of insects fed dusted foliage

Compound	Insect 1/	Foliage	Feeding 2/	Average deposit per square centimeter	Average mortality in 3 days
				Micrograms	Percent
N-Amyl-p-nitrobenzamide	Alder flea beetle	Alder	3	280	33
$NO_2C_6H_4CONHC_5H_{11}$	Armyworm	Corn	1	200	83
	Variegated cutworm	Cabbage	2	280	21
Chloromethyl 4-chlorophenyl	Alder flea beetle 3/	Alder	0	325	100
sulfone	Armyworm	Barley	2	230	100
$ClC_6H_4SO_2CH_2Cl$	Celery leaf tier	Swiss chard	1	250	100
	Large milkweed bug	Milkweed seed	-	265	100
	Spider mite	Castor bean	-	265	72
	Variegated cutworm	Cabbage	1	230	46
	Vegetable weevil 4/	Mustard	2	320	80
Chloromethyl phenyl sulfone	Alder flea beetle 3/	Alder	1	250	100
$C_6H_5SO_2CH_2Cl$	Armyworm	Barley	1	225	100
	Celery leaf tier	Swiss chard	1	280	100
	Large milkweed bug	Milkweed seed	-	250	100
	Spider mite	Castor bean	-	220	45
	Variegated cutworm	Cabbage	2	225	67
	Vegetable weevil	Mustard	2	265	92
3,4-Dichlorobenzamide	Alder flea beetle 3/	Alder	1	310	38
$C_6H_3Cl_2CONH_2$	Armyworm	Barley	2	265	50
	Celery leaf tier	Swiss chard	2	200	83
	Large milkweed bug	Milkweed seed	-	320	0
	Variegated cutworm	Cabbage	2	265	8

1/ Fourth instars unless otherwise indicated.
2/ 0, none; 1, slight; 2, moderate; 3, much.
3/ Third instar. 4/ Fourth instar and older.

Table 2. -- (Continued)

Compound	Insect 1/	Foliage	Feeding 2/	Average deposit per square centimeter	Average mortality in 3 days
				Micrograms	Percent
3,4-Dichloro-N-methylbenzamide	Alder flea beetle 3/	Alder	1	240	72
$C_6H_3Cl_2CONHCH_3$	Armyworm	Barley	2	200	42
	Celery leaf tier	Swiss chard	2	230	100
	Variegated cutworm	Cabbage	2	200	50
2-(Diethylamino)ethyl pentachlorophenyl ether	Alder flea beetle	Alder	2	200	0
$C_6Cl_5OCH_2CH_2N(C_2H_5)_2$	Armyworm	Corn	0	210	100
	California oakworm	Swiss chard	1	220	83
	Celery leaf tier	do.	1	200	100
	Large milkweed bug	Milkweed seed	-	265	0
	Variegated cutworm	Cabbage	3	210	0
N,N-Diisopropyl-p-nitrobenzamide	Alder flea beetle	Alder	1	250	13
$NO_2C_6H_4CON(CH(CH_3)_2)_2$	Armyworm	Corn	0	215	100
	California oakworm	Swiss chard	2	320	42
	Celery leaf tier	do.	1	295	88
	Large milkweed bug	Milkweed seed	-	235	0
	Variegated cutworm	Cabbage	2	215	38
1-Hydroxyphenazine	Armyworm	Corn	2	240	0
$C_6H_4:N_2:C_6H_3OH$	Celery leaf tier	Swiss chard	2	215	29
	Large milkweed bug	Milkweed seed	-	200	0
	Melonworm	Pumpkin	3	210	54
	Southern armyworm	Collard	2	210	83
	Variegated cutworm	Cabbage	2	240	67
	Yellow-striped armyworm	do.	1	295	100
Methyl 4-chlorophenyl sulfone	Alder flea beetle	Alder	0	285	100
$ClC_6H_4SO_2CH_3$	Armyworm	Barley	1	295	100
	California oakworm	Swiss chard	2	220	25
	Celery leaf tier	do.	2	230	83
	Large milkweed bug	Milkweed seed	-	210	0

Table 2. -- (Continued)

Compound	Insect 1/	Foliage	Feeding 2/	Average deposit per square centimeter	Average mortality in 3 days
				Micrograms	Percent
p-Nitrobenzoic acid, 2-chloroethyl ester $NO_2C_6H_4COOCH_2CH_2Cl$	Alder flea beetle	Alder	2	295	96
	Armyworm	Corn	1	280	92
	Celery leaf tier	Celery leaves	3	310	0
	Large milkweed bug	Milkweed seed	-	310	0
	Variegated cutworm	Cabbage	3	310	12
p-Nitrobenzoic acid, isobutyl ester $NO_2C_6H_4COOCH_2CH(CH_3)_2$	Alder flea beetle 5/	Alder	2	285	21
	Armyworm	Corn	2	240	8
	Celery leaf tier	Celery leaves	1	210	96
	Variegated cutworm	Cabbage	3	210	4
p-Nitrobenzoic acid, isopropyl ester $NO_2C_6H_4COOCH(CH_3)_2$	Alder flea beetle 5/	Alder	2	265	17
	Armyworm	Corn	2	310	0
	Celery leaf tier	Celery leaves	1	250	100
	Variegated cutworm	Cabbage	3	250	8
2-(p-Nitrobenzoyl)-1-phenylhydrazine $C_6H_5NHNHCOC_6H_4NO_2$	Armyworm	Corn	2	310	17
	Celery leaf tier	Swiss chard	3	225	21
	Large milkweed bug	Milkweed seed	-	250	0
	Melonworm	Pumpkin	2	295	92
	Southern armyworm	Collard	2	295	75
	Variegated cutworm	Cabbage	3	310	46
	Yellow-striped armyworm	do.	2	300	83
1,1,1,-Trichloro-2,2-bis(5-chloro-2-hydroxyphenyl)ethane $Cl_3CCH(C_6H_3OHCl)_2$	Armyworm	Barley	1	215	92
	Celery leaf tier	Celery leaves	2	215	12
	Large milkweed bug	Milkweed seed	-	255	0
	Melonworm	Pumpkin	1	295	96
	Southern armyworm	Collard	2	295	58
	Yellow-striped armyworm	Cabbage	2	285	50

5/ Mature larvae.

Table 2. -- (Continued)

Compound	Insect 1/	Foliage	Feeding 2/	Average deposit per square centimeter	Average mortality in 3 days
				Micrograms	Percent
1,1,1-Trichloro-2,2-bis(3,5-dichloro-2-hydroxyphenyl)-ethane $Cl_3CCH(C_6H_2Cl_2OH)_2$	Armyworm	Corn	0	230	100
	Celery leaf tier	Swiss chard	1	255	17
	Large milkweed bug	Milkweed seed	-	280	0
	Melonworm	Pumpkin	1	240	100
	Southern armyworm	Collard	1	240	100
	Variegated cutworm	Cabbage	1	230	96
	Yellow-striped armyworm	do.	1	250	100
1,1,1-Trichloro-2,2-bis(3,5-dichloro-4-methoxyphenyl)-ethane $Cl_3CCH(C_6H_2Cl_2OCH_3)_2$	Alder flea beetle 5/	Alder	0	230	3
	Armyworm	Corn	0	230	100
	Celery leaf tier	Swiss chard	3	230	13
	Variegated cutworm	Cabbage	2	230	11
			2	250	42
Bis(2,4,6-trichloro-3-hydroxyphenyl)methane $CH_2(C_6HOHCl_3)_2$	Alder flea beetle 5/	Alder	1	310	63
	Armyworm	Barley	3	255	12
	Celery leaf tier	Swiss chard	3	280	8
	Melonworm	Pumpkin	3	225	54
	Southern armyworm	Collard	3	225	4
	Variegated cutworm	Cabbage	2	250	100
2,4-Bis(trichloromethyl)-6-nitro-1,3-benzodioxane $NO_2\underbrace{C_6H_3OCH(CCl_3)O}CHCCl_3$	Alder flea beetle 5/	Alder	0	230	0
	Armyworm	Corn	1	280	90
	Celery leaf tier	Swiss chard	3	280	21
	Variegated cutworm	Cabbage	3	280	4

Table 3. -- Compounds causing less than 75 percent mortality of all species against which they were tested

Compound	Insect 1/
Acetic acid, alpha-(trichloromethyl)benzyl ester $CH_3COOCH(CCl_3)C_6H_5$	Alder flea beetle 2/ Celery leaf tier Melonworm Southern armyworm Variegated cutworm
N-Butyl-*p*-nitrobenzamide $NO_2C_6H_4CONHC_4H_9$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
N-sec-Butyl-*p*-nitrobenzamide $NO_2C_6H_4CONHCH(CH_3)C_2H_5$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
o-Chlorobenzamide $ClC_6H_4CONH_2$	Armyworm Celery leaf tier Variegated cutworm
p-Chlorobenzamide $ClC_6H_4CONH_2$	Armyworm Celery leaf tier Variegated cutworm
3-Chloro-alpha-(pentachlorophenoxy)acetanilide $CCl_5OCH_2CONHC_6H_4Cl$	Armyworm Celery leaf tier Peach aphid Variegated cutworm
p-Chloro-N,N-dimethylbenzamide $ClC_6H_4CON(CH_3)_2$	Armyworm Celery leaf tier Variegated cutworm
o-Chloro-N-ethylbenzamide $ClC_6H_4CONHC_2H_5$	Armyworm Celery leaf tier Variegated cutworm
o-Chloro-N-methylbenzamide $ClC_6H_4CONHCH_3$	Armyworm Celery leaf tier Variegated cutworm

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1/ Peach aphid specimens were nymphs and adults; all others were fourth instars except where indicated otherwise.

2/ Mature larvae.

Table 3. -- (Continued)

Compound	Insect 1/
Chloromethyl p-tolyl sulfone $CH_3C_6H_4SO_2CH_2Cl$	Armyworm Celery leaf tier Variegated cutworm
4,4'-Cyclohexylidene-bis(2,6-dichlorophenol) $C_6H_{10}(C_6H_2OYCl_2)_2$	Armyworm Celery leaf tier Variegated cutworm
N-Cyclohexyl-bis-(p-chlorophenyl)acetamide $(C_6H_4Cl)_2CHCONH(C_6H_{11})$	Armyworm Celery leaf tier Variegated cutworm
2-(Dibenzylamine)ethyl pentachlorophenyl ether $C_6Cl_5OCH_2CH_2N(CH_2C_6H_5)_2$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
N,N'-Dibenzyl-N'-(2,5-dichlorophenyl)-ethylenediamine $C_6H_3Cl_2NHCH_2CH_2N(CH_2C_6H_5)_2$	Armyworm Celery leaf tier Peach aphid Variegated cutworm
3,4-Dichloro-N-ethylbenzamide $C_6H_3Cl_2CONHC_2H_5$	Armyworm Celery leaf tier Variegated cutworm
1-(2,5-Dichlorophenyl)urea $Cl_2C_6H_3NHCONH_2$	Armyworm Celery leaf tier Peach aphid Variegated cutworm
N,N-Diethyl-p-nitrobenzamide $NO_2C_6H_4CON(C_2H_5)_2$	Armyworm Alder flea beetle 2/ Celery leaf tier Variegated cutworm
N,N-Dimethyl-p-nitrobenzamide $C_6H_4(NO_2)CON(CH_3)_2$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
N-(2-(2,4-Dinitrophenoxy)ethyl)dibenzylamine $(C_6H_5CH_3)NCH_2CH_2OC_6H_3(NO_2)_2$	Armyworm Celery leaf tier Peach aphid Variegated cutworm

Table 3. -- (Continued)

Compound	Insect [1]
N,N-Dipropyl-p-nitrobenzamide $NO_2C_6H_4CON(C_3H_7)_2$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
N-Ethyl-p-nitrobenzamide $NO_2C_6H_4CONHC_2H_5$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
N-Isobutyl-p-nitrobenzamide $NO_2C_6H_4CONHCH_2CH(CH_3)_2$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
N-Isopropyl-p-nitrobenzamide $NO_2C_6H_4CONHCH(CH_3)_2$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
N-Methyl-p-nitrobenzamide $NO_2C_6H_4CONHCH_3$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
2,2-Methylenebis(4-chlorophenol)diacetate $CH_2(CH_3COOC_6H_3Cl)_2$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
1,1-Methylene-di-2-naphthol $CH_2(C_{10}H_6OH)_2$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, benzyl ester $NO_2C_6H_4COOCH_2C_6H_5$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, p-bromophenyl ester $NO_2C_6H_4COOOC_6H_4Br$	Armyworm Celery leaf tier Variegated cutworm

Table 3. -- (Continued)

Compound	Insect 1/
p-Nitrobenzoic acid, *p*-chloroethyl ester $NO_2C_6H_4COOC_6H_4Cl$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, *o*-chlorophenyl ester $NO_2C_6H_4COOC_6H_4Cl$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, cyclohexyl ester $NO_2C_6H_4COOC_6H_{11}$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, 2,4-dinitrophenyl ester $NO_2C_6H_4COOC_6H_3(NO_2)_2$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, ethyl ester $NO_2C_6H_4COOC_2H_5$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, methyl ester $NO_2C_6H_4COOCH_3$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, 2-naphthyl ester $NO_2C_6H_4COOC_{10}H_7$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, *o*-nitrophenyl ester $NO_2C_6H_4COOC_6H_4NO_2$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, phenyl ester $NO_2C_6H_4COOC_6H_5$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, propyl ester $NO_2C_6H_4COOC_3H_7$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, 2-(2-pyridyl) ethyl ester $NO_2C_6H_4COOCH_2CH_2C_5H_4N$	Armyworm Celery leaf tier Variegated cutworm

Table 3. -- (Continued)

Compound	Insect [1]
m-Nitrobenzoic acid, 2-(2-pyridyl)ethyl ester $NO_2C_6H_4COOOCH_2CH_2C_5H_4N$	Armyworm Celery leaf tier Variegated cutworm
p-Nitrobenzoic acid, tetrahydrofurfuryl ester $NO_2C_6H_4COOCH_2\underline{CHCH_2CH_2CH_2O}$	Armyworm Celery leaf tier Variegated cutworm
alpha,alpha,alpha,2,5-Pentachloroacetanilide $Cl_3CONHC_6H_2Cl_2$	Alder flea beetle [2] Celery leaf tier Melonworm Southern armyworm
N-Propyl-p-nitrobenzamide $NO_2C_6H_4CONHC_3H_7$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
4,4-Sulfonyldiphenol $(C_6H_4OH)_2SO_2$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
2,2'-Sulfonylbis(4-chlorophenol) $(C_6H_3OHCl)_2SO_2$	Armyworm Celery leaf tier Variegated cutworm
2,4-Sulfonyldiphenol $(C_6H_4OH)_2SO_2$	Alder flea beetle [2] Armyworm Celery leaf tier Variegated cutworm
3,3',5,5'-Tetrachloro-2,2' stilbenediol $C_6H_2OHCl_2CH{:}CHC_6H_2OHCl_2$	Armyworm Celery leaf tier Variegated cutworm
2,2'-Thiobis(4-chlorophenol) $(C_6H_3OHCl_2)_2S$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm
alpha-(Trichloromethyl)benzyl alcohol $C_6H_5CHOHCCl_3$	Alder flea beetle [2] Celery leaf tier Melonworm Southern armyworm

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Table 3. -- (Continued)

Compound	Insect 1/
1-Trichloromethyl-4,4'-methylenebis (2,6-dichlorophenol) $CCl_3CH(C_6H_2OHCl_2)_2$	Armyworm Celery leaf tier Variegated cutworm
1,1,1-Trichloro-2,2-bis(5-chloro-2-methoxyphenyl)-ethane $Cl_3CCH(C_6H_3OCH_3Cl)_2$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
1,1,1-Trichloro-2,2-bis(3,5-dichloro-2-methoxyphenyl)-ethane $Cl_3CCH(C_6H_2Cl_2OCH_3)_2$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
1,1,1-Trichloro-2,2-bis(2,5-dimethoxyphenyl)ethane $Cl_3CH(C_6H_3(OCH_3)_2)_2$	Armyworm Celery leaf tier Variegated cutworm
1,1,1-Trichloro-2,2-bis(3,4-dimethoxyphenyl)ethane $Cl_3CCH(C_6H_3(OCH_3)_2)_2$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
2,2,2-Trichloro-1-(2,4-dihydroxyphenyl)ethanol $C_6H_3(CH)_2CH(CCl_3)OH$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
N-(2-Trichloro-1-hydroxyethyl)benzamide $C_6H_5CONHCHOHCCl_3$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
1,1,1-Trichloro-2-phenyl-2-biphenylethane $C_6H_5CH(CCl_3)C_6H_4C_6H_5$	Alder flea beetle 2/ Armyworm Celery leaf tier Variegated cutworm
3,4,6-Trichloro alpha-(2,3,5-trichloro-6-methoxyphenyl)-o-cresol $C_6HCl_3(OH)CH_2C_6\overline{H}Cl_3OCH_3$	Alder flea beetle Armyworm Celery leaf tier Variegated cutworm